

## **SUBSURFACE ELECTROMAGNETIC MEASUREMENTS USING CROSS-MAGNETIC DIPOLES**

### **Abstract**

Sensor assemblies including transmitter and receiver antennas to respectively transmit or receive electromagnetic energy. The sensor assemblies are disposed in downhole tools adapted for subsurface disposal. The receiver is disposed at a distance less than six inches (15 cm) from the transmitter on the sensor body. The sensor transmitter or receiver includes an antenna with its axis tilted with respect to the axis of the downhole tool. A sensor includes a tri-axial system of antennas. Another sensor includes a cross-dipole antenna system.